antiquity of the South African land-mass; and on the superficial formations (die Deckschichten). In chapter xxxv., entitled "Die Mesozoische Wüsten-periode," the author discusses the different stages of alteration shown both by the older rocks and by the superficial formations, through "einkieselung" or cementation by infiltrated silica, and "verkieselung" or replacement of carbonates by silica; and he gives his reasons for recognising successive periods of alteration and deposition consequent upon changes in the physical conditions of the land. He goes far afield in his argument, touching upon the various effects of rock-weathering under almost every climate of the globe, but with especial reference to desert-conditions. He brings this information to bear upon the South African geology generally, where he recognises evidence for desert-conditions of great antiquity and long duration, but with occasional intermission. Whether these speculations are well founded it will remain for the keen investigators now working in South Africa to decide.

In the same strain of more or less hypothetical deduction following upon an epitomised re-statement of the main facts, are the next two chapters—xxvi. "Die Periode der Brackwasserkalke und der Laterite," and xxvii. "Die Pluvialzeit und ihr Abklingen bis zur Gegenwart"—in which the probable condition of the interior of South Africa is traced through Tertiary and post-Tertiary times. It seems somewhat hazardous to correlate the isolated and widely scattered patches of thin sandstone and limestone by their lithological characters alone, and to assign them to successive periods. One line of argument by which the author reaches his conclusions with respect to the age of the desert-beds of the Kalahari is by comparing them with the more readily determinable Tertiary succession of Egypt. On questionable grounds he suggests that his "Pfannensandstein" may be assigned to the Eocene, his "Kalaharikalk" to a somewhat moist episode in Miocene and Lower Pliocene times; after which he recognises a period of dry conditions in the Middle Pliocene, and then a Pluvial period of late Pliocene and early post-Pliocene times. This Pluvial period may be accepted with some confidence as being in close relation to the occurrence of the Glacial period in northern Europe. Evidence from many other parts of the world tends to show that the progressive desiccation that has gone on since that period has not by any means been confined to the African continent.

Among the interesting side-issues raised or recapitulated in these later chapters of the book are questions as to the antiquity of the Kalahari fauna; the geological effect of wind-action; the obliteration of dry river-beds; "zoogene erosion"; the change of climate in North Africa during historic times; and others that we have no space even to catalogue.

The next—and last—chapter gives a review of the plant-life of the Kalahari, with especial reference to the evidence which it bears as to the changing conditions of the land. Then follow various appendices, occupying one hundred pages. These contain a few astronomical observations; a petrographical description of 447 rock-specimens and slides by Prof. Kalkowsky; twelve chemical analyses of rocks; an account of the land and freshwater shells from the newer superficial deposits by Prof. E. v. Martens; a full account of the diatoms by H. Reichelt; and a list of plants. The last twenty-seven pages of the book are occupied by the classified indices.

There is no attempt at artistic embellishment in the text-illustrations; and the same may be said of the numerous sheets of maps, plans, and sections contained in the "Kartenband," some of which, indeed, appear scarcely to justify their reproduction, while in many the scale seems to be unnecessarily large.

And now that we have growled our way through the book, and have earned the concluding pipe of peace, let us add that when a capable and earnest worker is willing, in publishing his results, to undergo the severe labour that a production of this kind must have entailed, our sense of gratitude toward him should be paramount, and should stifle all minor complaints and especially the impatient grumbling that arises in the main from our own unrealised indolence. G. W. L.

## ANIMAL PHOTOGRAPHY.

*Photography for the Sportsman Naturalist.* By L. W. Brownell. American Sportsman's Library. Pp. xviii+311; illustrated. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1904.) Price 8*s.* 6*d.* net.

ON several previous occasions we have had the pleasure of noticing some of the admirable volumes belonging to that series of the "Sportsman's Library" which deals exclusively with the various animals constituting the sportsman's quarry. In the volume now before us we have, on the other hand, one of a second series devoted to different aspects of sports and matters connected therewith. In regarding practical photography as an essential element in the education and outfit of every modern sportsman who desires to be something more than a mere slayer of game, the editor has undoubtedly been well advised; and he also has been exceptionally fortunate in securing the services of an expert with the experience and reputation of Mr. Brownell to make known to the beginner the mysteries of the camera and the technique of outdoor animal photography. If the reader is careful to bear in mind that when the author refers to "our animals" he means the members of the North American and not of the British fauna, the book will, we venture to think, prove as acceptable to sportsmen and field-naturalists on this side of the Atlantic as to the countrymen of the author; and if this turn out to be the case, a wide circulation would seem to be assured.

In his introduction Mr. Brownell gives a concise and yet comprehensive sketch of the history of photography, dwelling especially on the enormous strides it has made during the last half-dozen years. The loss of time that he himself experienced in having to learn everything for himself when first taking up animal photography is alluded to as a kind of justification (if one be needed) for the appearance of his

volume, while the value of accurate photographs of animals as a means of instruction in natural history is noticed in the concluding paragraphs of the introduction.

Possibly, and if so pardonably, the author is inclined to over-rate the importance of photographic illustrations in zoological work. In many respects, such as representing birds in their natural surroundings, its importance cannot, indeed, be over-estimated. But when the author goes on to deride the work of the pencil of the artist as a means of illustrating books on natural history, and to declare that the wood-cut and the "process-block" are things of the past in this connection, we take leave to differ from such a sweeping assertion. Nor are we alone in so doing, for Mr. W. T. Hornaday, in his recently issued "American Natural History," takes occasion to point out that photography has its limitations in the portrayal of animals, and that some illustrations demand the artist's pencil in order to become satisfactory zoological portraits. It is quite true, as Mr. Brownell urges, that the sketch, as compared with the photograph, may be crude and unfaithful to nature, yet it will nevertheless often accentuate or display essential features which are scarcely perceptible or absolutely hidden in the sun-portrait.

With this reservation, we are absolutely at one with the author in regard to the extreme importance and value of photography in natural history work, and, like him, we look forward to the time when real colour-photography will have been discovered and made available for everyday use. After describing in full detail the general technique of the photographic art and the kinds of camera and other apparatus best suited to the outdoor photographer of animal life, the author proceeds to discuss the mode of procedure in the case of different subjects, devoting one chapter to the larger mammals, another to the small mammals, a third to birds, and so on. So far as we can judge, all his advice is to the point, and the illustrations given as samples are in most cases admirable animal portraits. Not that attention is confined to animated nature, for we have a chapter on plant-photography, and another on the use of the camera in depicting sporting scenes and incidents, each as charmingly illustrated as their predecessors. Above all, the book is by no means dry reading, the technical details being enlivened with numerous and appropriate anecdotes. Mr. Brownell has, in fact, succeeded in producing a treatise on practical field-photography which it will be very hard to beat.

R. L.

## *A POPULAR STAR ATLAS.*

*Popular Star Maps.* A Rapid and Easy Method of Finding the Principal Stars. By Comte de Miremont, F.R.A.S. (London: George Philip and Son, Ltd., 1904.) Price 10*s.* 6*d.* net.

IT is by no means an easy task to construct a series of charts of the principal stars in the sky that will at once be of service to those wishing to make themselves familiar with the chief constellations or star groupings. Many, if not the majority, of star atlases printed for beginners are so belaboured with lines indicating right ascensions and declinations, names of constellations, Greek letters or numbers against each star, different notations for variable stars, &c., that when the beginner turns his eyes from the starry heavens towards a chart in order to find out the particular grouping in question he is unable to recognise it among the innumerable markings. For this reason many who have made valiant attempts to learn the stars have given up trying, and it is the atlases that are to blame and not the seekers after knowledge.

The ideal set of charts for a beginner should in the first place represent the appearance of the starry heavens as near as possible, and consist of maps showing small white discs or stars on a dark background the discs or stars varying in size according to the magnitude of the star; secondly, a fairly large region should be included in each map; thirdly, only stars to the third or fourth magnitude should be inserted; and lastly, each map should have an accompanying duplicate chart or key-map on the same scale, but with dark discs or stars on a white background, on which as much information as may be useful should be given.

In this way the beginner can at once find his particular stars on the first map, and learn their names, &c., on the accompanying key-map. This seems to be the logical method of aiding those who are not accustomed to deal with star charts, and it is a pleasure to find that such a series of maps is now available for those who wish to take advantage of them.

The charts is question, ten in number, and each accompanied by a key-map, have been prepared by Comte de Miremont, one who is thoroughly acquainted with the stars from the navigating point of view, and is familiar with the desire of sailors and others for a simple star atlas. Stars to the fourth magnitude only are inserted, and these are represented, on charts 10 inches square, as white stars on a dark blue background; in the accompanying but separate key-maps, of the same size, the stars are black on a white background. Great care has been taken to ensure accuracy in the star positions.

The method of projection, namely, the gnomonic, is also one which lends itself well to this type of atlas, for the whole of the celestial sphere can be projected on six plates, each plate thus representing one side of a cube enveloping the sphere. The upper and lower sides of the cube enclose the north and south polar regions respectively, and the other four sides the equatorial regions. To render more clearly the relations to each other of star groups near the edges of each of these equatorial sides in contact, four additional overlapping maps are added. Thus there are ten charts in all, and there is this advantage, that each one with its corresponding key-map can be taken out of the portfolio and used in the observatory, in the field, or on board ship by itself. On each chart and its key is a scale of right ascensions with the seasons of the year when each of the constellations is